Research Progress Report

Program: **VDACS – Specialty Agriculture Research Grant – FY06**

Project Title: **Evaluating Protected Culture for Season Extension in Strawberries**

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Project Description:

Strawberry production in Virginia represents a high value agricultural product in terms of profitability and human health. Currently, about 400 acres are spread throughout the state and the crop is primarily marketed on-farm via pick-your-own and farm stands as well as in local farmer's markets. Expansion of the industry is limited by the demographics of each production region due to the direct marketing situation. National suppliers of fresh strawberries, Florida and California, flood the retail market place during Virginia's field season. Consequently, it is to the advantage of the Virginia strawberry grower to capitalize on the market he/she already has and improve upon the seasonal availability of fresh strawberries for supplying their local/regional clientele.

Protected culture is commonly used in many European countries for producing high quality fruits and vegetables. Researchers and growers from other areas, including the US, document higher marketable yields due to less disease and an increased length of the growing season using tunnels. Cost per acre is significantly higher than growing outside without protection, however, consistency of production is increased through minimizing loss associated with unfavorable environmental conditions.

The purpose of this work is to investigate and optimize strawberry production using unheated high tunnels and compare the season to outdoor "conventional plasticulture". Research is currently ongoing at Blackstone, VA and Winchester, VA. These sites were chosen because of their climatic and cultural differences.

Progress to Date

Alson H. Smith AREC

The site for outdoor strawberry culture has been prepared and the greenhouse/high tunnel has been erected for experiments during the 2006-07 growing season.

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Methods-

During the fall of 2005, a pilot study was initiated to evaluate cultivar performance grown in an unheated poly-greenhouse (Figure 1). Plug plants of 4 cultivars (Table 1) were propagated by rooting strawberry tips in soil-less media under intermittent mist for 14 days. Plug plants were transplanted on November 1, 2005 in to soil-less media bags (Figure 1). Water and fertility were supplied using drip irrigation. Plants were over-wintered in the greenhouse by closing side curtains and vents. Floating row covers were also used to provide additional protection during cold temperatures.

Data was collected on flowering times and yield

Table 1. Cultivars tested at SPAREC in poly-greenhouse

Cultivar	Field season	Average field yield (lbs/A)
Sweet Charlie	Very Early	10-15,000
Festival	Mid-Early	15-20,000
Camarosa	Mid-Early	18-20,000
Chandler	Early	20,000+

Figure 1. Planting strawberries into soil-less media in a poly-greenhouse. Top left, unheated poly-greenhouse (18' x 24'); upper right, 14 day-old plug plant; lower left and

right, planting plugs by hand at 12" in row spacing x 14" between row spacing. Each bag contains 5 plants in a staggered double row.

Results-

The winter of 2005-06 was mild with a brief cold period during December. All plants survived well without supplemental heat. The greenhouse temperature was moderated over the winter using a thermostat controlled venting fan set at 60^0F. Plants never went fully dormant and continued to produce additional leaves and branch crowns. Flowering began in late February for Sweet Charlie and early March for Camarosa and Chandler. By early to mid-April most of the plants were at 75% bloom, which is 3-5 weeks ahead of field season depending on the year for this location. A floating row cover (1.2 oz/yd^2) was used as frost control during bloom.

Table 2. Percent flowering for the test cultivars in early spring 2006.

Cultivar	Date	% Bloom
Sweet Charlie	3/16/06	25
Festival	"	25
Camarosa	"	15
Chandler	"	15
Sweet Charlie	3/28/06	60
Festival	"	50
Camarosa	"	50
Chandler	"	50
Sweet Charlie	4/11/06	80
Festival	"	75
Camarosa	"	70
Chandler	"	85

Harvest began on 3/11/06 with Sweet Charlie and continued to May 11, 2006 when fruit size had begun to decrease and field picking became the primary focus. Fruit was picked twice a week or when necessary. Chandler was the highest yielding cultivar (1.36 lbs/plant) and Sweet Charlie was the lowest (0.96lb/plant) (Table 3.). This is consistent with results obtained for field ranking. Sweet Charlie is prone to break dormancy early in winter and a significant amount of flowers and subsequent yield is lost. Average fruit size ranged from 18 to 14 grams (Table 3), which is slightly less than what is observed in the field. Sweet Charlie had the lowest percentage of unmarketable fruit followed by Festival, Chandler and Camarosa (Table 3).

Table 3. Yield data for greenhouse grown strawberries.

Cultivar	Total Yield (lbs/plant)	Berry size(g)	%marketable
Chandler	1.36	15	83
Festival	1.12	18	86
Camarosa	1	16	81
Sweet Charlie	0.96	14	88

Figure 2. Early growth and fruit of greenhouse grown strawberries (3/01/06)

Discussion-

The results from the 2005-06 season were promising and showed that strawberry bloom and harvest can be advanced 4 weeks compared to field culture. Yields per plant were modest, however, by adjusting planting dates and fertility regimes, early season yields should be significantly increased. Based on these data, a 24" x 200' tobacco greenhouse or high tunnel planted at the density used (4,400 plants) would yield approximately 6,000 lbs of strawberries. To further extrapolate, an acre of Chandler grown in protected culture would yield about 50,000 lbs of fruit, which is over 2 times the yield of conventional field plasticulture.

This pilot has reinforced that protected culture warrants further investigation into optimization for this system in Virginia. During the upcoming fall of 2006, plots will be established at Blackstone and Winchester, VA investigating the effect of planting date and cultivar on yields. Additional experiments will examine plant performance in protected culture either planted in the ground using "conventional plasticulture " or using a soil-less system similar to what has been previously described. This work will be the primary focus for the VDACS funds FY 06. Additional funds will be sought for the upcoming FY 07 program to continue this work on protected strawberry culture.